

What is claimed is:

1. A lighting apparatus for emitting white light comprising:
a semiconductor light source emitting radiation having a wavelength in the range of from about 235 to about 430 nm;
a phosphor composition radiationally coupled to the semiconductor light source, the phosphor composition comprising a blue emitting phosphor, a green emitting phosphor and a red emitting phosphor comprising $(\text{Ba}, \text{Sr}, \text{Ca})_3\text{Mg}_x\text{Si}_2\text{O}_8:\text{Eu}^{2+}$, wherein $1 \leq x \leq 2$.
2. The lighting apparatus of claim 1, wherein the semiconductor light source is a light emitting diode (LED).
3. The lighting apparatus of claim 2, wherein the LED comprises a nitride compound semiconductor represented by the formula $\text{In}_i\text{Ga}_j\text{Al}_k\text{N}$, where $0 \leq i$, $0 \leq j$, $0 \leq k$, and $i + j + k = 1$.
4. The lighting apparatus of claim 1, wherein the phosphor composition is coated on the surface of the semiconductor light source.
5. The lighting apparatus of claim 1, further comprising an encapsulant surrounding the semiconductor light source and the phosphor composition.
6. The lighting apparatus of claim 1, wherein the phosphor composition is dispersed in the encapsulant.
7. The lighting apparatus of claim 1, further comprising a reflector cup.
8. The lighting apparatus of claim 1, wherein said phosphor composition further comprises at least one of a blue-green emitting phosphor, an yellow-orange emitting phosphor, and an additional red emitting phosphor.

9. The lighting apparatus of claim 1, wherein said phosphor composition comprises a spectral weight of 0.01-0.3 of the blue phosphor, about 0.1-0.5 of the green phosphor, and the balance of the red phosphor.

10. The lighting apparatus of claim 1, wherein said blue emitting phosphor is selected from the group consisting of $(\text{Ba}, \text{Sr}, \text{Ca})_5(\text{PO}_4)_3(\text{Cl}, \text{F}, \text{Br}, \text{OH})\cdot\text{Eu}^{2+}, \text{Mn}^{2+}; \text{Sb}^{3+}, (\text{Ba}, \text{Sr}, \text{Ca})\text{MgAl}_{10}\text{O}_{17}\cdot\text{Eu}^{2+}, \text{Mn}^{2+};$ $(\text{Ba}, \text{Sr}, \text{Ca})\text{BPO}_5\cdot\text{Eu}^{2+}, \text{Mn}^{2+};$ $(\text{Sr}, \text{Ca})_{10}(\text{PO}_4)_6\cdot n\text{B}_2\text{O}_3\cdot\text{Eu}^{2+};$ $2\text{SrO}\cdot 0.84\text{P}_2\text{O}_5\cdot 0.16\text{B}_2\text{O}_3\cdot\text{Eu}^{2+};$ $\text{Sr}_2\text{Si}_3\text{O}_8\cdot 2\text{SrCl}_2\cdot\text{Eu}^{2+};$ $\text{Ba}_3\text{MgSi}_2\text{O}_8\cdot\text{Eu}^{2+};$ $\text{Sr}_4\text{Al}_{14}\text{O}_{25}\cdot\text{Eu}^{2+}$ (SAE); $\text{BaAl}_8\text{O}_{13}\cdot\text{Eu}^{2+};$ and mixtures thereof.

11. The lighting apparatus of claim 8, wherein said red phosphor is selected from the group consisting of $(\text{Gd}, \text{Y}, \text{Lu}, \text{La})_2\text{O}_3\cdot\text{Eu}^{3+}, \text{Bi}^{3+};$ $(\text{Gd}, \text{Y}, \text{Lu}, \text{La})_2\text{O}_2\text{S}\cdot\text{Eu}^{3+}, \text{Bi}^{3+};$ $(\text{Gd}, \text{Y}, \text{Lu}, \text{La})\text{VO}_4\cdot\text{Eu}^{3+}, \text{Bi}^{3+};$ $(\text{Ca}, \text{Sr})\text{S}\cdot\text{Eu}^{2+};$ $\text{SrY}_2\text{S}_4\cdot\text{Eu}^{2+};$ $\text{CaLa}_2\text{S}_4\cdot\text{Ce}^{3+};$ $(\text{Ca}, \text{Sr})\text{S}\cdot\text{Eu}^{2+};$ $3.5\text{MgO}\cdot 0.5\text{MgF}_2\cdot\text{GeO}_2\cdot\text{Mn}^{4+}$ (MFG); $(\text{Ba}, \text{Sr}, \text{Ca})\text{MgP}_2\text{O}_7\cdot\text{Eu}^{2+}, \text{Mn}^{2+};$ $(\text{Y}, \text{Lu})_2\text{WO}_6\cdot\text{Eu}^{3+}, \text{Mo}^{6+};$ and mixtures thereof.

12. The lighting apparatus of claim 1, wherein said green phosphor is selected from the group consisting of $(\text{Ba}, \text{Sr}, \text{Ca})\text{MgAl}_{10}\text{O}_{17}\cdot\text{Eu}^{2+}, \text{Mn}^{2+}$ (BAMn); $(\text{Ba}, \text{Sr}, \text{Ca})\text{Al}_2\text{O}_4\cdot\text{Eu}^{2+};$ $(\text{Y}, \text{Gd}, \text{Lu}, \text{Sc}, \text{La})\text{BO}_3\cdot\text{Ce}^{3+}, \text{Tb}^{3+};$ $\text{Ca}_8\text{Mg}(\text{SiO}_4)_4\text{Cl}_2\cdot\text{Eu}^{2+}, \text{Mn}^{2+};$ $(\text{Ba}, \text{Sr}, \text{Ca})_2\text{SiO}_4\cdot\text{Eu}^{2+};$ $(\text{Ba}, \text{Sr}, \text{Ca})_2(\text{Mg}, \text{Zn})\text{Si}_2\text{O}_7\cdot\text{Eu}^{2+};$ $(\text{Sr}, \text{Ca}, \text{Ba})(\text{Al}, \text{Ga}, \text{In})_2\text{S}_4\cdot\text{Eu}^{2+};$ $(\text{Y}, \text{Gd}, \text{Tb}, \text{La}, \text{Sm}, \text{Pr}, \text{Lu})_3(\text{Al}, \text{Ga})_5\text{O}_{12}\cdot\text{Ce}^{3+};$ $(\text{Ca}, \text{Sr})_8(\text{Mg}, \text{Zn})(\text{SiO}_4)_4\text{Cl}_2\cdot\text{Eu}^{2+}, \text{Mn}^{2+}$ (CASI); $\text{Na}_2\text{Gd}_2\text{B}_2\text{O}_7\cdot\text{Ce}^{3+}, \text{Tb}^{3+};$ $(\text{Ba}, \text{Sr})_2(\text{Ca}, \text{Mg}, \text{Zn})\text{B}_2\text{O}_6\cdot\text{K}, \text{Ce}, \text{Tb};$ and mixtures thereof.

13. The lighting apparatus of claim 1, wherein said $(\text{Ba}, \text{Sr}, \text{Ca})_3\text{Mg}_x\text{Si}_2\text{O}_8\cdot\text{Eu}^{2+}$ phosphor emits radiation having a first emission peak at about 430 to about 475 nm and a second emission peak at around 610 to 700 nm.

14. The lighting apparatus of claim 1, wherein said $(\text{Ba}, \text{Sr}, \text{Ca})_3\text{Mg}_x\text{Si}_2\text{O}_8:\text{Eu}^{2+}$ phosphor contains a greater amount of Sr than Ba or Ca.

15. The lighting apparatus of claim 1, wherein $x = 1$.

16. The lighting apparatus of claim 1, wherein the total combined doping levels of Eu^{2+} and Mn^{2+} is from 0.1% to 40% by weight of the total phosphor composition.

17. A method for forming a lighting apparatus, the method comprising the steps of:

providing a near UV LED capable of emitting radiation having a wavelength of from about 235 to about 430 nm; and,

radiationally coupling a phosphor composition to the LED, the phosphor composition comprising a blue emitting phosphor, a green emitting phosphor and a red emitting phosphor comprising $(\text{Ba}, \text{Sr}, \text{Ca})_3\text{Mg}_x\text{Si}_2\text{O}_8:\text{Eu}^{2+}$, wherein $1 \leq x \leq 2$;

wherein the phosphor composition is capable of absorbing the radiation emitted by the semiconductor light source and converting the radiation into white light.

18. A phosphor blend comprising a blue emitting phosphor, a green emitting phosphor and a red emitting phosphor comprising $(\text{Ba}, \text{Sr}, \text{Ca})_3\text{Mg}_x\text{Si}_2\text{O}_8:\text{Eu}^{2+}$, wherein $1 \leq x \leq 2$.

19. The phosphor blend of claim 18, wherein said phosphor blend is capable of absorbing the radiation emitted by a semiconductor light source emitting from 235-430 nm and converting the radiation into white light.

20. A lighting apparatus for emitting light comprising:

a semiconductor light source emitting radiation having a wavelength in the range of from about 235 to about 430 nm;

a phosphor composition radiationally coupled to the semiconductor light source, the phosphor composition comprising a red emitting phosphor comprising $(\text{Ba}, \text{Sr}, \text{Ca})_3\text{Mg}_x\text{Si}_2\text{O}_8:\text{Eu}^{2+}$, wherein $1 \leq x \leq 2$.

21. A lighting apparatus for emitting light according to claim 20, wherein $x = 1$.

22. A lighting apparatus for emitting light according to claim 20, wherein said $(\text{Ba}, \text{Sr}, \text{Ca})_3\text{Mg}_x\text{Si}_2\text{O}_8:\text{Eu}^{2+}$ phosphor emits radiation having a first emission peak at about 430 to about 475 nm and a second emission peak at around 610 to 700 nm.